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Claims PTO

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AMW

--1. (Amended) An audio signal processing device for performing virtual acoustic image localization processing such that an acoustic image is localized at an arbitrary position in a vicinity of a listener, by reproducing by one of headphones and a plurality of speakers, output signals resulting from signal processing of input audio signals, the device comprising:

digital signal processing means for performing virtual acoustic image localization processing of said input audio signals;

a sensor for detecting a state of motion of the listener;

an A/D converter for converting into digital signals the analog detection signals from said sensor; and

control means for performing control so as to change and output in realtime transmission characteristics of said digital signal processing means, according to output signals from said A/D converter, wherein

at least part of said A/D converter is formed as part of said digital signal processing means.

2. The audio signal processing device according to Claim 1, wherein said A/D converter consists of a one-bit A/D converter which converts input analog signals into one-bit digital signals.

3. The audio signal processing device according to Claim 2, wherein said A/D converter is  $\Delta\Sigma$  type A/D converter.

4. The audio signal processing device according to

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Claim 2, wherein said one-bit A/D converter consists of a quantizer, and analog detection signals from said sensor are directly input to this quantizer.

--5. (Amended) The audio signal processing device according to Claim 1, wherein one of output signals of said A/D converter[, or] and control signals from said control means are output to external equipment.

6. The audio signal processing device according to Claim 1, wherein output signals of said A/D converter can be output to external equipment as digital detection signals converted into a different unit system.

7. The audio signal processing device according to Claim 1, wherein said sensor is a piezoelectric vibratory gyroscope which is an angular velocity sensor.

8. The audio signal processing device according to Claim 1, wherein said sensor is a geomagnetic direction sensor.

9. The audio signal processing device according to Claim 1, wherein said sensor is an inclination sensor.

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--10. (Amended) The audio signal processing device according to Claim 6, wherein said sensor is an angular velocity sensor, and angle data is calculated from A/D-converted angular velocity data, and the calculated digital angle data are output to the external equipment.

--11. (Amended) The audio signal processing device according to Claim 6, wherein said sensor is one of a velocity sensor and an acceleration sensor, and wherein displacement data is calculated from A/D-converted velocity or acceleration data and calculated digital displacement data are output to the external equipment.

--12. (Amended) The audio signal processing device according to Claim 1, further comprising a plurality of A/D converters and a plurality of sensors and processing of detection signals fed to said plurality of A/D convertors from the plurality of sensors detecting the state of motion of said listener is performed by said digital signal processing means.

13. The audio signal processing device according to Claim 5, wherein said output to the external equipment is performed through requests from the external equipment.

14. The audio signal processing device according to Claim 5, characterized in that said output to the external equipment is performed with a constant period.

--15. (Amended) An audio signal processing device that

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performs virtual acoustic image localization processing such that an acoustic image is localized at an arbitrary position in a vicinity of a listener by reproducing using one of headphones and a plurality of speakers, output signals resulting from signal processing of input audio signals, wherein said audio signal processing device comprises:

a one-bit quantizer for converting analog detection signals from a sensor that detects a state of motion of said listener into digital signals, and

control means for performing control so as to modify in realtime transmission characteristics of said audio signal processing device, according to output signals from said one-bit quantizer.

--16. (Amended) The audio signal processing device according to Claim 15, wherein one of output signals from said one-bit quantizer and quantization error signals in said one-bit quantizer are output to external equipment.

--17. (Amended) The audio signal processing device according to Claim 15, wherein one of output signals from said one-bit quantizer and control signals from said control means are output to external equipment.

--18. (Amended) The audio signal processing device according to Claim 15, wherein output signals from said one-bit quantizer are output to external equipment as digital detection signals converted into a predetermined unit system.

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19. The audio signal processing device according to Claim 15, wherein said sensor is a piezoelectric vibratory gyroscope which is an angular velocity sensor.

20. The audio signal processing device according to Claim 15, wherein said sensor is a geomagnetic direction sensor.

21. The audio signal processing device according to Claim 15, wherein said sensor is an inclination sensor.

--22. (Amended) The audio signal processing device according to Claim 18, wherein said sensor is an angular velocity sensor, and angle data is calculated from A/D-converted angular velocity data, and calculated digital angle data are output to the external equipment.

--23. (Amended) The audio signal processing device according to Claim 18, wherein said sensor is one of a velocity sensor and an acceleration sensor, displacement data is calculated from one of A/D-converted velocity and acceleration data, and calculated digital displacement data are output to the external equipment.

--24. (Amended) The audio signal processing device according to Claim 15, further comprising a plurality of said one-bit quantizers and a plurality of sensors and processing of detection signals fed to said plurality of one-bit quantizers from said plurality of sensors which detect the state of motion of said listener is performed by said digital signal processing means.

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25. The audio signal processing device according to Claim 17, wherein said output to the external equipment is performed through requests from the external equipment.

26. The audio signal processing device according to Claim 17, wherein said output to the external equipment is performed with a constant period.

--27. (Amended) An interface circuit for supplying analog detection signals from a sensor as digital detection signals, comprising:

an A/D converter for converting said analog detection signals into digital signals;

computation means for converting said A/D converter output signals into detection data in a prescribed unit system; and

memory means for storing detection data computed by said computation means, wherein

detection data stored in said memory means are read by external equipment, wherein

at least part of said A/D converter, said computation means and said memory means are formed as part of digital signal processing means which performs signal processing of and outputs input audio signals.

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28. The interface circuit according to Claim 27, wherein said A/D converter is a one-bit A/D converter.

29. The interface circuit according to Claim 28, characterized in that said one-bit A/D converter is a  $\Delta\Sigma$ -type A/D converter.

30. The interface circuit according to Claim 28, wherein said one-bit A/D converter consists of a quantizer, and analog detection signals from said sensor are directly input to this quantizer.

31. The interface circuit according to Claim 27, wherein said sensor is an angular velocity sensor, and said computation means outputs the detection data as angle data.

--32. (Amended) A signal processing device, comprising:

an audio signal processing device for reproducing by one of headphones and a plurality of speakers output signals resulting from signal processing of input audio signals and for performing virtual acoustic image localization processing such that an acoustic image is localized at an arbitrary position in a vicinity of a listener, and

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an image display device for reproducing images before either one eye or both eyes of said listener;

said audio signal processing device including

digital signal processing means for performing said virtual acoustic image localization processing of said input audio signals,

an A/D converter for converting into digital signals analog detection signals from a sensor which detects a state of motion of said listener, and

control means for performing control so as to change in realtime transmission characteristics of said digital signal processing means, according to output signals from said A/D converter and for performing control so as to update display content or display position in said image display device; and wherein

at least part of said A/D converter is formed as part of said digital signal processing means.